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ON PARTHENOGENESIS IN SPIDERS.¹

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The only references known to me upon the question of the occurrence of parthenogenesis in araneads are the following: Blackwall (1845) took young females of *Tegenaria domestica*, *T. civilis*, *Agelena labyrinthica*, *Ciniflo atrox*, *Drassus sericeus*, *Theiridion quadripunctatum* and *Segestria senoculata* and kept "most of these individuals . . . in captivity from one to three years after they had completed their moulting and attained maturity; yet three only, an *Agelena labyrinthica*, a *Tegenaria domestica*, and a *Tegenaria civilis*, produced eggs, and they proved to be sterile, though several of the others, to which adult males were subsequently introduced, laid prolific eggs after coition." Blanchard (1857) also reached the same conclusion that eggs laid by unimpregnated females prove sterile. Then Balbiani (1873) adopted this conclusion, though his own observations were not decisive: "Having imprisoned during a whole year several females of *Tegenaria domestica*, I have noted that the first batches were composed exclusively of fecund eggs, while the subsequent batches contained always a variable number of sterile eggs, of which the quantity increased with the batch, so that they ended in not containing a single egg able to develop. But it is evident that if these females had been gifted with the faculty of reproducing without the concourse of the male, all the successive batches should have been equally fecund."

On the other hand, Campbell (1883) kept a female of *Tegenaria guyonii* in captivity a whole year, during which she underwent two moults; then she laid eggs from which young hatched. And Damin (1893) imprisoned a female *Filistata testacea* Latr. from the spring of 1891 until the spring of 1893; she moulted twice in the summer of 1891 and once in the spring of 1892, then made a cocoon from which young spiders emerged. He notes the extreme rarity of the males of this species, and asks: 'Does not this absence of the male indeed indirectly cause the,

¹ Contributions from the Zoölogical Laboratory of the University of Texas, no. 86.

parthenogenesis of *Filistata*?" It may be remarked that *Artemia salina* is an instance of this kind. A paper by Holmberg (1878) has been inaccessible to me.

It is generally held that the females of spiders are not ready for coition until they have passed their final moult, and that not until then does the copulatory plate, the epigynum, become fully developed. However, Bertkau (1885) has shown that *Atypus piceus* oviposits several years in succession, and a moult occurs (with change of the seminal receptacles) after the first years of egg-laying; he remarks that the same is probably true also of *Gnaphosa lucifuga*. This would show that spiders may undergo moults after they are fully mature, and indeed it is very likely that when the female lives several years, and this is known to be the case in a number of species, she undergoes a moult each year after reaching maturity, for moulting is a necessary integral part of the excretory process. Then I (1903) have described the case of a *Lycosa bilineata* (Emerton) (*L. ocreata pulchra* Montg.) that copulated successfully on June 3, and on the following July 12 moulted. During the present year I caught a *Filistata* with a cocoon containing young; she moulted on July 2 and again on August 28. These instances indicate that spiders may be sexually mature before their final moults.

But one can be sure that a female is immature when her epigynum is still a small, smooth plate, and that when she is in such a condition she cannot be impregnated. And during the course of earlier observations on the mating habits I have noted that males avoid females that are not mature. Accordingly, females of Entelognæ found with their epigyna small and imperfect may be considered virginal.

During the spring of this year the common *Lycosa relucens* Montg. was found in large numbers in the early part of March, males and females running over the ground in a wood at Austin, Texas. At that time very few mature individuals of either sex were discovered, the greater number being one or two moults removed from the mature condition. When they become full grown they are rarely found running upon the ground in the daylight, but then usually remain hidden under leaves and stones. Twenty-two females were secured, some on the third and the

others on the ninth of March, and kept isolated in glass cases, with fairly rich feeding, until June 12. All of these when caught showed the epigyna small and imperfect and this fact, in connection with the observation that few of the males at that time of the year were mature, made it certain that all the females were virginal. All underwent moults during captivity, one moulted twice, the others only once; after moulting all but four made cocoons containing eggs. Eleven of the spiders made one cocoon each, seven made two cocoons each, and one made three cocoons. Of the total of twenty-eight cocoons, eleven were destroyed by the spiders shortly after their construction, the mothers eating the eggs, and most of these cocoons were very imperfect; while the remaining seventeen were removed from the mothers immediately after their completion to save them from such possible demolition, handled as gently as possible, and kept in separate bottles to test their fecundity. But not one of the eggs in any of these seventeen cocoons hatched, nor even reached the stage of the early blastoderm; one batch of eggs was fixed at the age of twenty-four hours, but on examination showed no cleavage nuclei near the surface, so they had certainly not reached the sixteen-cell stage. All these eggs were shrivelled and dry.

Therefore virginal females of *Lycosa relucens* form cocoons with eggs in them, but these eggs do not develop. And such females show always more or less imperfect construction of the cocoons and the tendency to eat the eggs; in mature individuals of *Lycosa* that I have bred in captivity, the eggs always developed, and the mother rarely ate the eggs.

My observations corroborate those of Blackwall and Blanchard, and in the species watched by us normal parthenogenesis seems not to occur; on the other hand, there are the two positive cases of its occurrence mentioned by Campbell and Damin. Certainly parthenogenesis is exceptional in spiders.

LITERATURE.

Balbiani, G.

- 1873 Mémoires sur le Développement des Aranéides. Bibl. L'Ecole des Hautes Études, 7.

Bertkau, P.

- 1885 Ueber den Saisondimorphismus und einige andere Lebenserscheinungen bei Spinnen. Zool. Anz., 8.

Blackwall, J.

- 1845 Report on some Recent Researches into the Structure, Functions and Oeconomy of the Araneida, etc. 14th Rep. Brit. Ass. Adv. Sci.

Blanchard.

- 1857 Observations relatives à la génération des Arachnides. C. R. Acad. Sci. Paris, 44.

Campbell, F. M.

- 1883 On a probable Case of Parthenogenesis in the House-spider (*Tegenaria Guyonii*). Journ. Linn. Soc. London, 16.

Damin, N.

- 1893 Ueber Parthenogenesis bei Spinnen. Verh. zool.-bot. Ges. Wien, 43.

Holmberg, E. L.

- 1878 Caso de partenogenesis en una Arana. Periodico zoologico, 2.

Montgomery, T. H., Jr.

- 1903 Studies on the Habits of Spiders, particularly those of the Mating Period. Proc. Acad. Nat. Sci. Philadelphia.